

Claims

[c1] **Claim 1 [previously Claim 16]:** A method for operating a reciprocating internal combustion engine equipped with a lean NOx trap on gaseous hydrogen, comprising the steps of:

operating the engine at an equivalence ratio of about 0.15 to 0.65, except when purging the lean NOx trap;

and

operating at an equivalence ratio of about 1.1 when purging the lean NOx trap.

[c2] **Claim 2 [previously Claim 17]:** A method according to Claim 1 [16], further comprising the step of operating the engine with the mass of EGR being approximately equal to the mass of air and fuel when the lean NOx trap is being purged.

[c3] **Claim 3 [previously Claim 18]:** A method according to Claim 1 [16], further comprising the step of operating the engine with the mass of EGR being approximately equal to the mass of air and fuel when the lean NOx trap is being purged and when the engine is operating at or near maximum load.

- [c4] Claim 4 [previously Claim 19]: A method for operating a reciprocating internal combustion engine, comprising the steps of:
 - providing substantially premixed air and hydrogen to a combustion chamber of the engine wherein said air and hydrogen are at an equivalence ratio of approximately unity; and
 - providing residual gases to the combustion chamber, with the mass of the residual gases exceeding 40% of the total mass of gases provided to the combustion chamber.
- [c5] Claim 5 [previously Claim 20]: A method according to Claim 4 [19], wherein the residual gases comprise engine exhaust gas trapped in the combustion chamber from a prior combustion event and engine exhaust gas recirculated to the combustion chamber.
- [c6] Claim 6 [previously Claim 21]: A method according to Claim 4 [19], wherein the engine has a three-way catalyst disposed in an exhaust system connected to the engine.